Effect of digestive enzymes on digestibility and biological value of mechanically deboned turkey meat

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MAGYAR AGRÁR- ÉS ÉLETTUDOMÁNYI EGYETEM

Introduction

Enzymatic hydrolysates of mechanically deboned meat (MDM) for a long time have been used as flavouring and functional food ingredients in the food industry and also as the bases of formula foods for special dietary uses. The aim of the present study was to produce MDM hypo-antigenic products with improved digestibility and high biological value to be used as a milk protein alternative.

Materials and methods

Turkey MDMs were adjusted to 2, 6 and 12% (w/v) of meat protein, which then were treated (60, 80, 100, 120 min) with digestive enzymes (trypsin and/or α-chymotrypsin, or pancreatin) in 0.1% $NaHCO_3$ buffer solution (pH 7.5), homogenised by Ultra Turrax device, and then the proper enzyme was added with continuous stirring at 37°C.

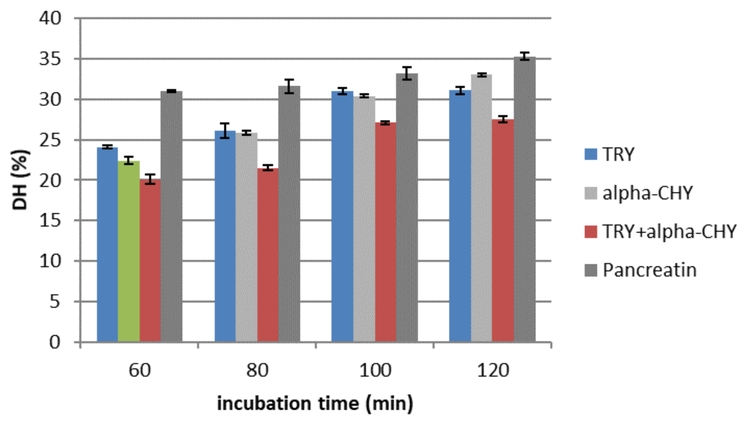
MDM hydrolysates were assessed for degree of hydrolyses (DH%) by using tritinobenzensulphonic acid method and Molecular Weight Distribution by SDS-PAGE.

Modification of immune reactive binding sites in MDM hydrolysates was monitored by immunoblot with cow's milk, chicken egg or meat allergic human patients' sera.

Biological value indexes (True Digestibility (TD), Net Protein Utilisation (NPU), Biological Value (BV)) were determined using rat feeding trials.

Results I.

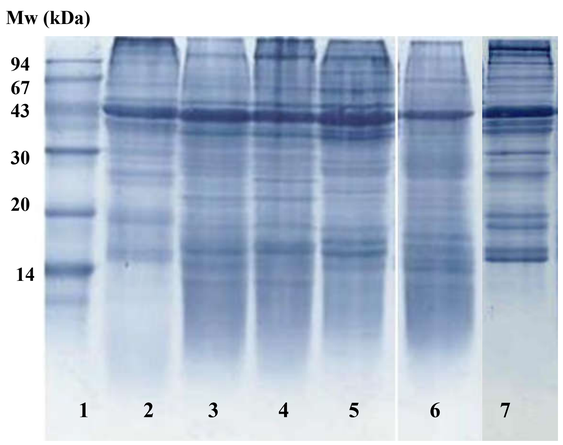
Effects of the different proteases and incubation time on DH (%) of turkey meat products (Fig. 1.)



The optimised reaction conditions of hydrolysis were at 6% (w/v) of meat protein for 60 min. Among the applied enzyme modifications, pancreatin enzyme (at 37°C, pH 7.5) provided sufficient degree of hydrolysation (Fig 1.).

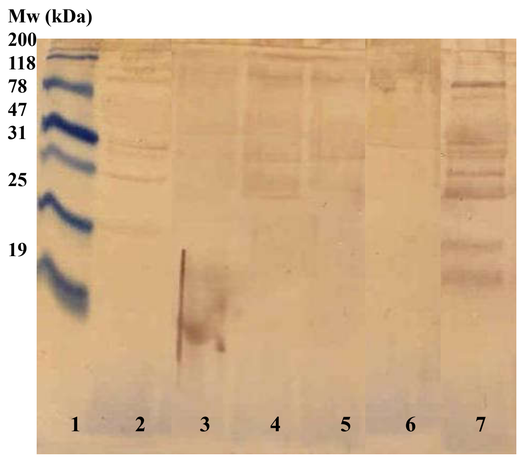
Results II. and discussion

Protein distribution of turkey meat hydrolysates by SDS-PAGE (Fig. 2.)



1. MW
2. T0 turkey meat product control
3. TI turkey meat with trypsin and α-chymotrypsin
4. TII turkey meat with α-chymotrypsin
5. TIII turkey meat with trypsin
6. TIV turkey meat with pancreatin
7. P0 pork meat product control

Immunblot patterns of turkey meat hydrolysates (Fig. 3.)



Biological value indices (TD, NPU, BV) of turkey meat hydrolysates based protein (Fig. 4.)

Groups (n=10 rats)	Intake nitrogen (g)		Faecal nitrogen (g)		Body nitrogen (g)		TD (%)		NPU (%)		BV (%)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
TI	1.30	0.00	0.14	0.01	1.95	0.04	92.73	0.50	68.30	1.84	73.65	1.59
TIV	1.03	0.02	0.12	0.00	1.88	0.03	94.06	1.81	78.81	2.83	83.87	4.62

Average reduction in the number of protein bands can be observed at the hydrolysates as compared to the unmodified turkey meat, but the major protein bands specific to the turkey meat are still detectable (Fig. 2.).

The immunoblotting protein pattern of the unmodified meat and the enzyme-treated products showed that pork meat control sample showed more intense protein response (IgE-reactive) against the meat positive pooled serum compared to the turkey meat, where few bands were stained only as weak antigens (Fig. 3.)

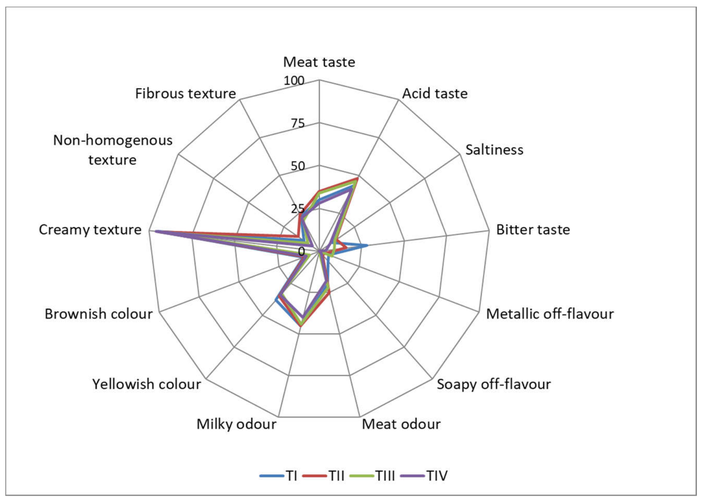
Cow's milk and chicken egg-positive pooled human sera did not indicate immune response either with the untreated or the enzymatically modified samples.

According to the results of animal feeding experiments, turkey meat pancreatic hydrolysates (TIV) had the highest biological value (BV, 84%) and digestibility (TD, 94%) (Fig. 4.).

The hydrolysed product was accepted by test-consumers in the sensory survey, no complaint was raised regarding taste, smell, or consistency (Fig. 5.).

Among the MDM hydrolysates, the pancreatic hydrolysate proved to be the most favourable in terms of biological value and digestibility as well as hypoallergenic property.

Sensory profile of the meat-based hydrolysates mixed into kefir (Fig. 5.)



Acknowledgement

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